

Contemporary Technologies and Society: Innovations, Artificial Intelligence, and Challenges

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**CONTEMPORARY TECHNOLOGIES AND SOCIETY:
INNOVATIONS, ARTIFICIAL INTELLIGENCE,
AND CHALLENGES**

Collective Scientific Monograph

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and Oleg Bogut*

Katowice 2023

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1.13. THE USE OF DIGITAL EDUCATIONAL RESOURCES IN THE LEARNING OF NATURAL SCIENCE IN UKRAINIAN SCHOOL

Along with the development of human civilisation in the 21st century, the importance of digital technologies in society has grown rapidly. Digitalisation permeates all areas of activity. Education keeps pace with the times, and it is impossible to imagine a modern school without the use of digital educational resources. At the same time, the natural sciences are the fastest growing area of knowledge, which opens up opportunities for the emergence of new industries, the introduction of innovations in the development of technology, healthcare, agricultural intensification and sustainable development of nature and society. Thus, there is a social order to improve the natural science literacy of the younger generation, taking into account the latest advances in natural sciences and digital technologies. All of this requires improving science education at all levels, especially at school. Biology, physics, and chemistry are quite complex but intuitive subjects, the study of which often requires demonstration of processes, systems, and laws, which makes it somewhat difficult for students to learn the sciences, especially in a distance learning environment. That is why digital educational technologies are helping modern teachers – digital tools and applications used to create new opportunities in the educational process for the transfer of knowledge, perception of knowledge, assessment of the quality of education and development of the student's personality.

At the current stage of society's development and the introduction of digital educational technologies into everyday life, the educational process at school cannot be implemented without the use of computer equipment and relevant software resources. In this regard, the role of computers and the Internet in the organisation of educational activities in educational institutions has increased dramatically. Academician of the National Academy of Pedagogical Sciences of Ukraine V. Bykov emphasises that: «By combining traditional education and information and communication technologies, it is possible to develop and reproduce the natural talents and abilities of the individual. In the learning process, the use of these technologies creates additional conditions and leads to the emergence of new goals and updating the content of education, allows to achieve much better results in learning activities, ensuring the formation and development of each student's own educational trajectory» (Bykov, 2021: 9).

Similar visions of the impact of the use of information and communication technologies on the development of a student's personality are expressed by foreign teachers. For example, S. Stavreva-Veselinovska and J. Voogt note that the integration of digital technologies into the educational process can bring subject content closer to pupils, facilitate learning, provide easy viewing, quick access and appropriate use of scientific materials. The combination of traditional and digital technologies in the process of blended learning/teaching has many advantages, namely: pupils learn to organise and plan their learning activities independently; the teacher saves time in class; the likelihood that pupils will have access to learning materials increases; demonstration of creative ways of solving problems presented in a particular topic is encouraged, thus increasing the use of digital technologies; pupils form the habit of transforming individual work into group work, etc. (Stavreva-Veselinovska, 2016; Voogt, 2013).

A significant number of national scholars (N. Bakhmat, V. Bykov, M. Zhaldak, L. Kartashova, L. Mospan, etc.) agree that the use of modern information and communication technologies in education allows creating an environment that stimulates the interest and curiosity of the student. In turn, the educational process becomes clearer and more understandable, enabling each student to learn at their

own pace, and relieves teachers of excessive workloads if digital technologies are used systematically. Thus, the digitalisation of education encourages teachers to modify the content and methods of teaching various subjects at school, to expand and deepen the information obtained through the latest information systems and technologies in a timely manner, and the teacher's professional activity becomes richer and more interesting through the use of digital educational resources.

Natural education requires special attention in terms of the use of information technology, as it is closely related to experiments and research. Schools often lack the material support for laboratory work in the natural sciences. Along with the lack of material support, there is also the problem of the inability to conduct some experiments for safety reasons. That is why the use of digital technologies in the classroom is an excellent and at the same time necessary experimental supplement to teaching physics, chemistry, and biology. For example, the use of computer models and virtual laboratories provides a unique opportunity to visualise simplified models of natural phenomena, and in the course of an experiment, additional factors can be gradually introduced to complicate the model and bring it closer to the real phenomenon. In addition, digital educational technologies make it possible to simulate situations that cannot be achieved experimentally in school lessons.

In order to effectively use digital educational technologies in teaching schoolchildren, science teachers first need to find appropriate software. In the process of searching for it, one should focus on the expected results from the use of digital educational technologies and take into account their possible advantages, namely:

- saving time on explaining new educational material;
- deepening the perception of new educational material, thus improving the memorisation of educational information;
- development of analytical and abstract thinking through visual perception of symbolic and schematic representations of educational information, identification of cause-and-effect relationships;
- increasing students' interest and enthusiasm for learning by getting them interested in non-traditional ways of presenting educational material and, as a result, increasing their learning motivation;
- differentiation and personalisation of pupils' work, which allows them to choose a special pace of learning, develop their individual abilities and talents, direct them to develop experimental and research skills, etc;
- development of students' skills and abilities to perform tasks independently, search for necessary information and systematise it in the information space;
- the ability to simultaneously use audio, video, multimedia teaching materials, compile them, which allows to go beyond school textbooks, supplement and deepen their content;
- ensuring objective control of knowledge using a computer-based test of the level of knowledge.

Digital educational resources are understood as a didactic combination of educational software tools, electronic textbooks, electronic tests, computer models of processes and phenomena, virtual laboratories, educational games and simulators, simulators of various purposes and levels of complexity that ensure the achievement of the relevant and objectives of the educational process and differ in the form of implementation, type of interface and features of the use of information technology.

Digital educational resources can be independent software products or partially implemented in one of them. Their integration takes place around a special platform for posting materials. According to V. Soroka, such a platform is a learning management system that creates opportunities for posting e-learning materials in various formats, restricting access to them, controlling the process of learning

materials and completing tasks, organising interaction between participants in the educational process through the network, communication, developing electronic didactic materials, etc. (Soroka, 2016: 76).

The use of digital educational resources in the educational process can be divided into three categories according to their specific purpose: software resources for creating electronic learning tools, resources for publishing educational materials and recording students' activities, and resources for interaction between participants in the educational process.

For example, to support the educational activities of biology teachers, a number of digital educational resources for various purposes are currently available, such as:

TeamLabBody is considered the best app for 3D anatomy.

Inspiration is an app that helps visualise the learning process. You can create charts, cards, and graphs with your students in the classroom using this software.

Plickers is a mobile application that "reads" special cards with students' answers in seconds and automates their checking and grading.

Moodle is a learning platform that provides teachers, high school students and administrators with a set of advanced computer-based learning tools, including distance learning.

Open edX is a free course management system. PhET is a set of interactive computer models based on scientific research for teaching and learning physics, chemistry, biology, mathematics and other sciences.

Graasp is a platform that allows teachers to create virtual research and learning spaces based on different stages of the educational process.

Learningapps.org – resources for creating electronic simulators, tests, and surveys.

Google services are a great online environment for teamwork. **Google Classroom** is a virtual classroom management system.

Kahoot and Quizizz are English services that allow you to turn learning into a game.

Sway is an app for creating newsletters, documents and presentations in minutes.

Scape is a communication tool for free calls.

Office 365 is a free service for teachers and students.

Thingling is a service for creating interactive posters.

The labels of some of these educational resources are shown in Fig. 1.

Digital educational resources can be used in biology lessons, for example, to solve a number of problems:

- presentation of new educational material (presentations, videos);
- repetition and consolidation of what has been learned (Padlet, Realtimeboard);
- intermediate and final control of knowledge acquisition (Quizziz, Kahoot);
- assistance to students in preparing for the State Final Examination (SFE) and External Independent Testing (EIT) – Eduget, an innovative online project to prepare students for the EIT; free online courses on the EdEra platform «Hitchhiking in Biology», «Biology: Plants, Fungi and Lichens»; the Academy educational portal offers preparation for the EIT in various subjects, including natural sciences. The ZNOUA YouTube channel contains free video tutorials to help students successfully pass the EIT.

Digital educational resources are also used for methodological and didactic preparation of teachers for lessons. Thus, it is advisable for a biology teacher to use the selection presented in Fig. 2: «Internet Resources for Biology Teachers» (Methodological Portal); «All Biology Lessons» (School Life); «Ukrainian Biological Site»; «All Biology» website, which contains a variety of information on all sections of biology, and the form of its presentation is accessible to the average reader; educational portal «For the Lesson» – a project that collects all the author's materials that teachers upload to the portal.



Fig. 1. Labels of the main digital educational resources

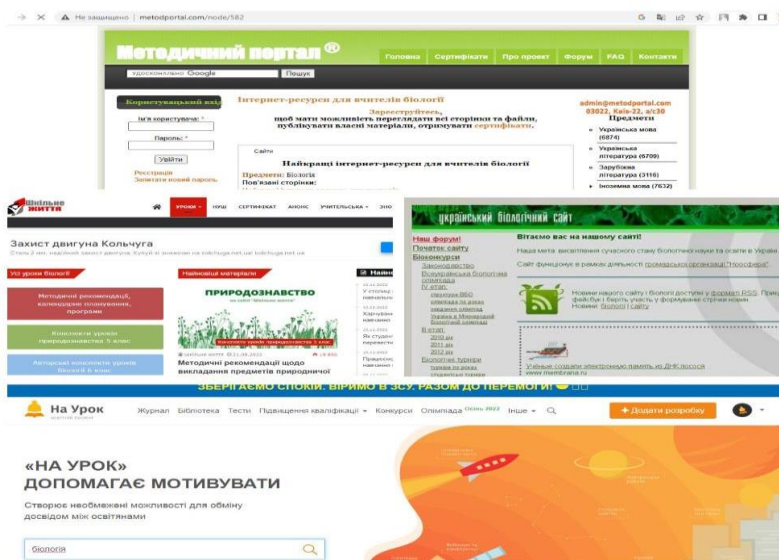


Fig. 2. Ukrainian online platforms for biology teachers

Thus, there are quite a few online resources designed to help teachers and pupils, which in turn need to be systematised. For this purpose, it is worth using webmixes, such as Webmix «Symboloo», which conveniently stores all online resources in one place. A Webmix is a set of tiles, each of which is a link to a service or website. Such online bookmarks are accessible from any gadget. It is advisable to make the start page in a browser with a webmix (for example, Biologist's Webmix) public, so you can share the created collection of links with your colleagues or pupils.

According to L. Bondar and O. Mishchenko, the use of educational digital technologies has significant advantages in teaching chemistry and physics. In particular, in the process of presenting new

material, they allow solving the following learning tasks: studying phenomena and processes of the micro- and macrocosm, complex technological and biological systems using computer graphics and computer modelling; presenting the course of various chemical and physical processes that actually occur at very high or very low speeds on a convenient scale for studying (Bondar, Mishchenko, 2011: 10).

Thus, the use of digital educational technologies and software resources brings students closer to the real natural world, forming a visual representation of microscopic objects and phenomena, modelling various chemical and physical experiments and chemical reactions, including those that are hazardous to health. For example, when explaining new material, it is advisable to show experiments that cannot be carried out «on site» for various reasons. These experiments involve reagents and substances that are prohibited in educational practice and are not available in school laboratories. However, they are discussed in school textbooks, with descriptions and equations.

In order to effectively demonstrate basic physical and chemical concepts (e.g., the structure of an atom, the formation of a chemical bond) in class, presentations and videos should be used on the screen. This ensures that the material is well remembered. However, it is important to remember that the main focus should always be on working with the text and tasks, the presentation or video should last no more than 25 minutes, and pupils need to change activities, postures, and movements.

In educational institutions, it is not always possible to conduct demonstration experiments, laboratory experiments, practical work, etc. due to the lack of necessary equipment, reagents or their toxicity. The study of educational material becomes possible when teachers use virtual learning laboratories in both inorganic and organic chemistry and physics.

Working in a virtual laboratory, pupils assemble laboratory equipment and conduct virtual chemical and physical experiments. During the experiments, pupils record their observations, chemical reaction equations and conclusions in a laboratory journal, and complete experimental tasks that require them to make appropriate changes to parameters and observe changes in the graph. Schoolchildren often approach these tasks with particular enthusiasm. Despite their simplicity, these tasks are very useful because they allow pupils to see a vivid connection between computer experimentation and analytical problem solving. Thus, the virtual laboratory provides a visual link between theoretical and practical classes.

For example, let's take the PhET virtual online laboratory, an interactive modelling site launched by Nobel Prize winner Carl Wieman in 2002 (Fig. 3). The peculiarity is that the site is available for computers in an online format (in a browser) and on personal mobile devices. It offers a wide variety of experiments that can be used in the study of various topics, for example: «Chemistry. Substances», «Simple substances – metals», «Speed of chemical reactions», etc. In addition, the virtual chemical laboratory can be used at the stage of learning new material. For example: «Alkanes», when considering the structure, isomerism and homology of alkanes, a task is given to pupils' groups. Each group receives its own limiting hydrocarbon molecule and builds it using the virtual chemical laboratory, then presents its answers.

With the advent of digital educational technologies and resources, the boundaries between theoretical and experimental physics have become less clear, as a new type of experiment has emerged – the virtual physical experiment. We believe that conducting virtual experiments is one of the main applications of digital technologies in physics lessons. Of course, a virtual laboratory cannot replace a real physical laboratory, but virtual experiments help pupils to form ideas about physical phenomena and processes, broaden their horizons, and ensure better understanding and assimilation of the educational material. In the process of performing virtual experiments, which pupils conduct independently while working in the laboratory, they become familiar with the methods of studying physical phenomena and learn to work with physical devices and equipment. In other words, they are

actually acquiring and mastering knowledge on their own. Therefore, schoolchildren are motivated to further study this material. Working and conducting experiments in a virtual laboratory requires certain skills that are typical for real experiments, such as choosing initial conditions, setting up the parameters of the experience, etc. For example, before performing a laboratory task of weighing body weight, pupils are given the task of balancing virtual scales. Or for a laboratory task on measuring the current strength, pupils need to build a virtual drawing of the equipment to perform the measurement. This greatly expands the practice of students performing logical operations of analysis and drawing conclusions based on the results of the experiment.



Fig. 3. «PhET» – a virtual laboratory

Examples of virtual physical laboratories are online platforms such as PhET, Go-Lab, and Next-Lab (Fig. 4), which contain various examples of physical phenomena that can be used to study laboratory work in class, as well as various applications that allow you to calculate and confirm the results of experiments, evaluate pupils' work, etc.

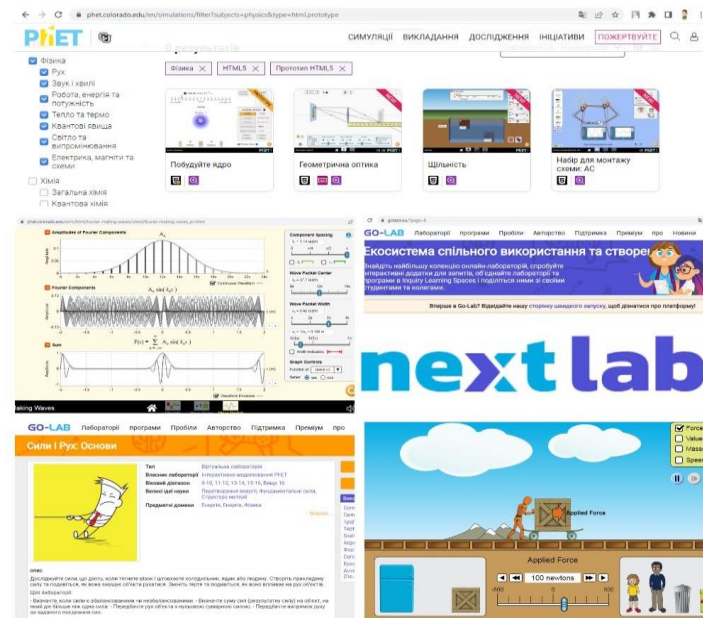


Fig. 4. PhET, Go-Lab and Next-Lab virtual laboratories

We have included the following digital educational resources for didactic and methodological training of teachers that will help turn student learning into an exciting process in chemistry and physics lessons:

«**ThatQuiz: Periodic Table of Elements**» – the periodic table of Mendeleev, which allows you to learn the chemical elements by playing the interactive game «Identify the Element». After registering, the teacher can test students' knowledge of the periodic table of elements by sending a link where students will take a quiz and the teacher will receive the results of the test.

«**Quick Chemistry: Calculator**» is very easy to use: just enter the formula, for example NaNO_3 , on the special keyboard and click "Search". The program will immediately provide basic information about the compound: molar mass, mass percentage of composition, water solubility, etc.

«**MEL Chemistry**» is one of the best mobile applications for molecular visualisation. It can be viewed from any angle on a regular screen or with virtual reality glasses.

«**Hypermarket of Knowledge. Chemistry**» – here you can find all the materials for a chemistry teacher to prepare for lessons and conduct laboratory work.

«**Lab4Physics**» is a smartphone application that helps you to recreate experiments on your phone or tablet. It allows you to conduct many experiments without special equipment in the classroom.

«**Mini Gear**» is a YouTube channel that demonstrates how to create models of various mechanisms and devices with your own hands from scrap materials.

«**The Physics Teacher's Website**» contains a collection of didactic materials and methodological developments for physics teachers, including notes, presentations, experiments, videos, textbooks, extracurricular activities, etc.

«**Thang010146**» is an author's channel on the YouTube platform, which features more than 500 demonstration videos on the operation of various mechanisms and provides a brief explanation of the meaning of the processes being reproduced.

«**Amgen Teach**» is an online educational resource for science teachers that guides them in organising learning in a way that presents educational information to pupils in terms of application in various life situations, which involves discussion, identifying cause and effect relationships, and formulating reasoned conclusions.

Based on the experience of systematic use of these digital educational technologies and software resources, we have come to the conclusion that they are effective in creating new quality opportunities for pupils and teachers in the acquisition and implementation of science education.

Today's generation of schoolchildren is turning less and less to books for information and more to gadgets. Therefore, the use of digital educational technologies in the educational process is a great way to ensure the assimilation of educational material in various subjects, transforming knowledge into powerful skills and abilities not only in the classroom but also in various non-standard life situations. Given the low motivation of today's pupils, the use of digital educational technologies in biology, chemistry, and physics lessons can significantly improve the level of science education of schoolchildren, provided that they are systematically and accessibly applied and take into account differentiated and individual approaches in accordance with the age-related characteristics of personality development.

The methodology of using digital educational resources by a teacher during lessons is determined by the specific pedagogical tasks that he or she solves in the process of studying a school subject. The solution of pedagogical tasks is possible with the integrated use of various types of software tools, so in the future it is necessary to consider the didactic principles and methodological approaches to the use of digital educational technologies in the theory and practice of school science education.

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ANNOTATIONS

Part 1. INNOVATIVE EDUCATIONAL TECHNOLOGIES AND PRACTICES IN EDUCATION

1.1. Oleg Bogut. The current state of the IT market and hiring challenges for the IT companies.

The digitalization and globalization of the world economy create a series of challenges that affect global economic markets and the information technology market. For timely and effective responses by IT companies to these challenges, understanding the market conditions and problems of hiring and personnel management is essential. A crucial tool that addresses hiring and personnel management issues of IT companies is intelligent information technologies. These are aimed at supporting managerial decision-making through automation tools, incorporating artificial intelligence.

Keywords: IT market analysis, human resources, intellectual information systems, artificial intelligence

1.2. Iryna Briukhovetska, Oksana Golikova, Victoria Myroshnychenko. Innovative educational technologies in the professional training of specialists: modern aspects.

The paragraph examines modern innovative educational technologies and outlines their role in the modernization and improvement of the quality of education. Approaches and different interpretations of such definitions as "educational innovations", "innovative learning", "innovative educational technologies", "interactive learning" are outlined, which allows establishing the essential features of the use of innovative educational technologies in the process of professional training. The information technologies most often used in professional training are characterized. The authors believe that the use of innovative information technologies in the educational process allows to increase the productivity of learning and to get a more complete picture of the future professional activity.

Keywords: educational innovations, innovative learning, innovative educational technologies, information technologies, interactive learning.

1.3. Olha Chemerys, Volodymyr Tovstohan, Lyubov Kibenko. Individualization of the process of professional training of future specialists using innovative educational technologies.

The paragraph is devoted to the analysis of problems of individualization of the process of professional training of future specialists by means of innovative educational technologies. The definitions of "innovation", "technology", "individualization of education", "innovative educational technologies" were analyzed. The technology of tutor support is characterized as helping the student to discover his own individual potential, to determine the trajectory of self-development as a subject of his own life, the ways and methods of successful personal and professional self-realization and self-improvement. The main characteristics of the technology of contextual learning, with the help of which the subject and social content of the future professional activity of the specialist is modeled, are determined. The significance of information technologies in the process of individualization of the process of professional training of future specialists is substantiated.

Keywords: individualization of learning, innovative technologies, technology of tutor support, technology of contextual learning, innovative multimedia technologies.

1.4. Iryna Korotiaieva. Online-strategies and tools for remote teaching and learning in higher educational institutions.

The purpose of this paragraph is to provide a descriptive analysis of the current strategies and online tools for remote teaching and learning in higher educational institutions. Both native and foreign educational experience of recent years has contributed greatly to the solution of this problem. In this paragraph an attempt is made to characterize the most popular platforms, such as Google Classroom, ZOOM, Google Meet in the context of distance education. The paragraph presents a brief description of up-to-date online tools for remote teaching and learning (Google Jamboard, Padlet, Pear Deck, Nearpod, Kahoot, Flipgrid, Edpuzzle), their advantages and benefits in synchronous and asynchronous learning. Much attention is paid to the application of the platform Kahoot! in the ESL classroom for various purposes and activities. Methodological guidelines are suggested for ESL teachers as for building strategies for distance teaching and learning with the help of the current online platforms and instruments.

Keywords: innovative technologies, online tools, distance teaching and learning, synchronous or asynchronous learning, ESL Classroom, English language teacher, university.

1.5. Vasyl Kot, Nazar Shynkarchuk, Valentyna Yuskovych-Zhukovska. Application of the Arduino platform in the system of transportation of thermally unstable substances.

Today, the Internet of Things technology is gaining popularity in the world. The widespread use of the concept of Arduino boards in everyday life turns everything around into smart things. The development of this area thanks to the flexible automation system allows the user to control, manage and have optimal balanced systems with economical energy consumption. A compact device based on an Arduino board was created with the possibility of autonomous operation and integration into a refrigerator or refrigerator.

Keywords: Internet of things, Arduino, digital technologies, Peltier elements.

1.6. Yuri Lotiuk, Andrii Hrysiuk, Liudmyla Solovei. Development of a smart home module for microclimate control in an interior.

Smart home software enables the control and management of all smart devices located within a house using a remote control or gadget. The Smart Home system itself analyzes environmental parameters and makes decisions according to a predefined algorithm. Through customization settings, smart technologies can be effectively utilized.

Keywords: Smart home, smart technologies, Arduino, software.

1.7. Tetiana Mostova, Alina Buchneva. Application of innovative technologies in the process of implementing a new Ukrainian school: managerial aspect.

The paragraph deals with the peculiarities of using innovative technologies in the process of implementing the New Ukrainian School from the point of view of the managerial aspect. The attention is focused on one of the key competencies, such as innovation. The main tasks and functions of innovative management of an educational institution are highlighted. Also, examples of innovative technologies that were introduced by the municipal institution "Vasylivka Secondary School of I-III Degrees No. 3" of the Vasylivka City Council of Zaporizhzhia Region during the 2022-2023 academic year are considered. The paragraph focuses on one of the innovative technologies that is becoming increasingly popular in the context of the new Ukrainian school – xTiles. The advantages and peculiarities of implementing the xTiles platform in the management of an educational institution, its use in the context of interaction and communication between participants in the educational process are considered. Also, the aspect of teachers' readiness for innovative activities is considered.

Keywords: innovative technologies, management, team, school.

1.8. Yuliia Nadolska, Diana Konovalenko, Anastasiia Zinchenko. Implementation of modern information and communication technologies in the study process in the conditions of distance learning and teaching.

The paragraph discusses the main advantages of the Internet for learning and teaching linguistic and literary subjects. The characteristics of information and communication technologies used in the study process and the effectiveness of their application in a distance format have been analysed. The forms and methods for teaching languages and literature classes that are available and effective for the learners are outlined and the features of their modelling and application in class are revealed. The advantages of distance education and multifunctional educational platform "Moodle" are highlighted.

Keywords: information and communication technologies, Internet, learning and teaching languages, learning and teaching literature, distance learning and teaching, educational platforms.

1.9. Vladyslava Perminova, Angela Sikaliuk, Svitlana Lytvyn. Use of the latest technologies in vocational training: overview, trends, challenges.

In today's rapidly evolving world, it is important for universities to equip students with the skills and knowledge they need to succeed in their chosen careers. As industries continue to transform and adapt to new technological advances, the landscape of vocational education is also changing. To keep pace with these changes, universities are adopting modern technologies, methods, and techniques to provide students with a dynamic and relevant learning experience. This paragraph delves into the exciting field of vocational learning at the university level, exploring innovative approaches that are changing the way students prepare for their future careers. From the latest technologies to progressive teaching methods, we will look at the key trends that are revolutionising vocational training and discuss their impact on student learning and skills acquisition.

Keywords: vocational training, technology, new trends in vocational training, personalized learning, microlearning, blended learning, peer learning.

1.10. Mykola Popovych, Nataliia Vynnyk, Viktoriia Vorona, Mykola Iehupov. Prospects of science and education in the digital era: European and global experience.

The system of science, education and training is increasingly becoming part of the digital transformation and can use its advantages and opportunities. However, it is also necessary to effectively manage the risks of digital transformation. Making the digital leap in science, education, research and training will be vital for people to reach their potential without leaving anyone behind. It will also be vital to proving the effectiveness, relevance and legitimacy of transformation and training systems to prepare and shape the future in the context of an open science strategy.

Keywords: science, education, digital era, digital transformation, digital technologies.

1.11. Viktoriia Pryma, Kateryna Borovyk. The latest trends in English teaching as a foreign language.

This paragraph is devoted to the newest methods of foreign languages learning. The first thing we drew our attention was the rapid adaptation of learning technologies to modern requirements – quarantine measures related to the coronavirus infection, war, blackouts in our country, and others. In the current situation, knowledge of foreign languages has increased dramatically, not only in a personal sense, but also in the labor market in general. As a result, people of all ages are forced to learn languages not only for their own development, but also to compete in the labor market. We selected, considered, and analyzed the newest and most effective, in our opinion, methods of learning foreign languages. The teachers of higher educational establishments face one of the priority tasks, which is to increase the interest of students of higher education in learning a foreign language, mainly English. To achieve the

set priority task, teachers are constantly searching for new, interesting and at the same time effective forms and methods of teaching a foreign language. Facing to the competence paradigm in the process of foreign language teaching is due to a few objective circumstances, among which the most significant is the ability to coexist in the common life space, which means being able to build a dialogue with all subjects of this space, being able to establish humanitarian intercultural ties between representatives of different cultures and countries. An important role in this is played by a foreign language, which acts as, perhaps, the only possible tool, with the help of which the establishment of bonds of mutual understanding and interaction between representatives of different linguistic and ethnic communities becomes real. The main limitations of the study include the number of participants, which does not allow the results to be generalized to a larger population.

Keywords: language learning, teaching methods, modern technologies in teaching.

1.12. Oleksandr Sheremeta, Roman Sheremeta, Valentyna Yuskovych-Zhukovska. Development of a mobile application for autonomous learning.

Creating a digital educational space for mobile applications simplifies and optimizes software development processes and user access to educational content. At the same time, all confidential information is in a secure cloud storage, and access to the necessary functions of the program can be obtained through a web browser on any gadget. At the same time, the web resource must be constantly available without an Internet connection.

Keywords: digital technologies, mobile learning, mobile applications.

1.13. Inna Siaska, Vadym Ponomarenko. The use of digital educational resources in the learning of natural science in Ukrainian school.

The purpose of the study is to analyse and summarise the possibilities of using digital educational technologies and resources in the implementation of natural education of schoolchildren in Ukraine. The advantages of using digital educational technologies and software resources in physics, chemistry, and biology lessons as necessary means of experimental study of natural subjects, increasing students' cognitive activity and motivation to learn, and ensuring the effective organisation of the educational process are proved. The paragraph offers a list of digital educational resources for teachers and students that will be useful in the process of teaching biology, chemistry, and physics.

Keywords: natural education, digital educational resources, teacher of natural sciences, schoolchildren.

1.14. Olha Sopina, Valerii Bohdan. Peculiarities of using testing e-platforms for assessment of knowledge and skills of degree-seeking students at educational institutions of Ukraine.

The paragraph investigates the peculiarities of using testing e-Platform for assessing the knowledge and skills of degree-seeking students at modern educational institutions in Ukraine, the main task of which is to assist university teachers in the automated and adequate assessment of subject-specific competences of degree-seeking students. The authors consider the meaning of the definitions of "test" and "testing" and determine the specifics of their semantic meanings. Particular attention is paid to the survey and the system of test control of knowledge because of the assessment of future specialists. The positive and negative aspects of assessment through e-platforms (such as plagiarism, dishonesty, etc.) are noted. The ways to increase the objectivity of the assessment of degree-seeking students' knowledge are indicated.

Keywords: degree-seeking student, competency, assessment, online testing, testing e-Platform.

1.15. Yuliia Synyshyna. The role of technology in modern education: trends and implications.

This paragraph highlights the role of technology that has significantly transformed the landscape of education, offering innovative solutions to enhance learning experiences. This paragraph delves into the evolving role of technology in modern education, focusing on emerging trends and their implications for educators, institutions, and students. From digital learning platforms and online education to artificial intelligence, virtual reality, and gamification, this paragraph explores how technology is reshaping education. It also highlights the implications of these trends, including improved accessibility, enhanced engagement, personalized learning, data-driven decision-making, teacher empowerment, challenges and concerns associated with technology integration and possible solutions. Understanding these trends and their implications is crucial for ensuring that technology continues to empower and enrich education in the XXI century.

Keywords: educational technology, modern education, future of learning.

1.16. Andriy Tkachuk. Application of multimedia technologies in the study of drug addictions as socio-political dangers for safety, labor protection and civil defense.

The paragraph analyzes the importance of multimedia technologies in the conditions of long-term distance learning. New approaches to the study of socio-political dangers associated with the formation of narcotic addiction to opiates and opioids, psychostimulants and cannabinoids, nicotine, and alcohol, in institutions of higher education in the process of remote teaching of safety, labor protection and civil defense, are considered. It is proposed to implement this through a more effective layout and presentation of appropriate lecture material using a multimedia presentation system. Examples of the composition of lecture material in multimedia presentations regarding harmful habits, the causes of their formation, consequences, and prevention from them are given. The material on the most dangerous chemical drugs is considered in more detail. The causes and consequences of the formation of rapid habituation and dependence on them are highlighted.

Keywords: multimedia technologies, sociopolitical dangers, drug addiction.

1.17. Vanda Vyshkivska, Yevhen Prokofiev, Tetiana Yelchaninova. Use of adaptive technologies in the vocational training system: theoretical and practical aspects.

The paragraph analyzes adaptive learning technologies as one of the types of innovative learning technologies, which organically combine: orientation to interdisciplinary learning, reflection on the specifics of multivariate professional and pedagogical activities, simultaneous management and self-organization of students based on reflection. Adaptive technologies can be implemented as specialized software or services that adapt to the needs of individual students in the learning process. The main advantages of adaptive technologies are identified: automation of assessment and forecasting; regulation of the degree of complexity of the content of education; constant monitoring of individual educational achievements; obtaining data about the individual needs of students; the ability to follow one's own educational route; the possibility of continuous improvement of educational courses, etc.

Keywords: technologies, technologization of learning, adaptive learning, adaptive technologies, information adaptive technologies, adaptive interaction of subjects of the educational process, individualization of learning.

1.18. Valentyna Yuskovich-Zhukovska, Oleg Bogut. Electronic educational environment for acquiring professional skills in web developer training.

The digitalization of most production spheres and the provision of electronic services in the digital society dictate a significant demand for specialists in the field of information technology, especially web developers. A priority task for higher education institutions is the creation of electronic educational spaces to develop information-digital competencies of future programmers tailored to the needs of the IT market. IT company requirements focus on

applicants' strong hard and soft skills for vacant positions. These electronic educational spaces should cater to the needs of the IT industry.

Keywords: electronic educational environment, hard skills and soft skills of programmers, web programming, CMF Drupal.

1.19. Oksana Abramova, Viktoriia Vdovenko, Iryna Prykhodko. Features of the formation of research skills of school students while working on stem-projects.

The authors of the paragraph considered the peculiarities of the formation of research skills of students of general secondary education institutions during project activities. The scientific activity of students acts as an element of the integration of basic scientific knowledge into their everyday life and the development of independent work skills. This work not only improves the quality and depth of knowledge acquisition, but also teaches students their practical development. In addition, it helps to form a scientific worldview in the younger generation and to develop scientific research skills in them. Such activities contribute to strengthening the connection between theoretical knowledge and practical skills, which is a stage in the preparation of schoolchildren for further professional and personal development. An important task in terms of research work is the determination of requirements for content, forms, and its organization. For this purpose, the authors of the paragraph conducted an analysis of students' research activities. This made it possible to determine the peculiarities of the organization of such activities during work on integrated projects. The organization of students' research work requires the correct definition of the elements of the structure and the principles of forming the content of the educational material.

Keywords: research skills, research activity, schoolchildren, project activity, integrated projects.

1.20. Alina Arendarenko, Kateryna Khomenko, Chubenko Valentyna. Integration of information technologies for effective teaching of medical and pharmaceutical specialties.

The paragraph discusses the importance of utilizing information and innovative technologies in the process of studying subjects within medical and pharmaceutical specialties. The modern advancement of technologies provides students with unique opportunities for more effective and engaging learning. Specifically, the access to up-to-date information through the Internet, the use of virtual learning environments, video lessons, mobile applications, and other technological tools are discussed. With the high technological development of society, information technologies are no longer just supplementary instruments but an integral part of the educational process. They enable a shift in the approach to learning and contribute to enhancing the practical training of students in medical universities.

Keywords: medicine, pharmacy, innovative technologies, modern programs, education.

1.21. Mariana Baran. Educational programs are a modern challenge.

At this stage of society's development, one of the most pressing issues is related to education. Education is obtained by everyone, from small to large, who at least somehow seeks to develop and improve. There are many educational opportunities for everyone, but despite all these opportunities, our education is not at the highest level of development. This is especially felt in Ukraine, in such a difficult and difficult time for all of us. And to improve education and bring it to a higher level, changes are needed that would take into account the requirements of modern life. Therefore, one of the important issues in education concerns educational programs at different levels of education: their creation, adjustment, etc.

Keywords: education, educational program, requirements, educational process.

1.22. Liliya Baranovska, Tetyana Tarnavska, Nataliia Zhuravel. Innovative technologies for training specialists in foreign philology: experience of higher education institutions of Ukraine.

The paragraph substantiates the expediency of the use by institutions of higher education of innovative educational technologies of Ukraine. This is due to desire and necessity joining the country to the European Union, for which innovation is a priority. At the same time, Ukraine is recognized as a country that is an innovator, which is just being formed. Innovative technologies are especially relevant for professional training of the future specialists in English philology, who are responsible for promotion quality of international interaction. It is identified the significant for their professional training competences based on the Standards of Higher Education of Ukraine. Pedagogically and professionally expedient for the formation of philology majors' readiness for successful professional activity are case-study, heuristic technologies education, information and communication technologies.

Keywords: specialist in English philology, innovative educational technologies, professional competences, standard of higher education.

1.23. Olga Bilychenko. Conceptual foundations of forming the social-communication culture of student youth through the means of literary art.

The paragraph highlights the theoretical foundations of the technology of forming the social and communication culture of students of higher educational institutions. The author justifies the necessity of its application in the university educational process. The place and role of works of fiction in the process of youth personality formation is revealed. The purpose, target orientations of the technology, as well as its conceptual foundations are determined, among which we highlight the principle of humanization, systematicity, and artistry. The author proves that the technology should create certain mechanisms for the formation of the social and communication culture of the personality of young people, which are necessary for the formation of future specialists.

Keywords: higher education, social-communication culture, innovative technologies.

1.24. Alla Bovtruk, Iryna Slipukhina, Sergii Mieniailov. Aspects of using CHATGPT AI in bilingual teaching of physics in higher education institutions.

Bilingual training of specialists with higher technical education is an urgent educational problem. Artificial intelligence tools have produced new learning opportunities that can be used by all participants in the educational process. The use of ChatGPT in bilingual teaching of physics in institutions of higher education is a special, little-covered practical niche. Specific examples of the use of AI in the preparation of physics lectures are studied, and aspects of interaction with it are clarified.

Keywords: ChatGPT, bilingual education, teaching of physics, higher education institutions.

1.25. Vira Hlazova, Tetiana Kravets, Yana Pozoieva. The organization of project activities during the lessons of mathematics.

The paragraph describes the project activities of students during the lessons of mathematics as a tool for creating an environment in which learning would become easier, more meaningful and more effective. Different classifications of projects are analysed, and types of projects are identified. The main requirements for using the project method in teaching mathematics to implement the concept of "learning through action" in the context of the New Ukrainian School reform program are described. The main stages of the implementation of the educational project are highlighted, the topics of the mathematics lessons, which can be used for project activities, are presented. The actions of a student and a teacher in project activities are defined. The ways to implement STEM education ideas during the mathematics lessons are suggested. The examples of mathematics mini projects for 6th grade students of the New Ukrainian School with the use of the Tinkercad program are presented.

Keywords: project activity, project, New Ukrainian School, mathematics, STEM.

1.26. Antonina Danko. Innovative technologies in the educational space – a way to improve the quality of education.

The author chooses this topic for this paragraph not by chance, because the conditions in which we work, live and study are very difficult, so everything that can make our work easier is relevant now. Today we are going to talk about art scribbling, a process of visualizing a complex meaning with simple images, in which the images are drawn in the process of explanation. Scribbling... Scribe... At first glance, it seems to be a newly formed neologism... But in fact, we have been familiar with this concept since childhood. With the help of simple drawings, we tried to convey what we saw, heard, certain information, feelings, mood, emotions. It turns out that in this way you can talk about complex things in a simple and accessible way and explain certain material in an interesting way. This method is called scribbling - a process of visualizing complex content in a simple and accessible way, during which images are sketched directly during the transmission of information. The peculiarity of scribbling is that it simultaneously involves different senses: hearing and vision, as well as human imagination, which contributes to better understanding and memorization. These features make it one of the methods of modern technology that helps to explain complex material in an accessible and easy way and contributes to the development of education.

Keywords: scrapbooking; art scrapbooking; types of visualization; facilitation; video scrapbooking; effective learning, teacher; students.

1.27. Larisa Zhizhchenko, Nadia Tenditna. On the issue of innovative technologies in the education of philology students.

The paragraph is devoted to the analysis of the technology of productive reading (PRT) as an effective means of teaching and educating a cultural reader-philologist. It has been proven that TVET plays an important role in the formation of cognitive and communication skills of students. The essence of productive reading is highlighted, the main stages of using technology in classes in literary disciplines are characterized, methods and techniques for developing professional reading skills of philology students are defined. The role of ICT in the formation of a creative approach to reading of future vocabulary teachers is analysed.

Keywords: technology of productive reading, text, author, reader, annotated reading, ICT.

1.28. Valentyna Kovalenko. The model of the social and communication space of a higher educational institution as a component of the socialization technology of philological students (on the example of the Donbas State Pedagogical University).

The paragraph focuses on the social and communication processes of a higher educational institution, in particular the process of student socialization in the conditions of the functioning of the social and communication space. The author analysed a certain number of existing models of famous researchers, based on which his own concept was proposed. Also, the author concludes that the rapid spread of information affects the specifics of communication, and new forms of communication create a new social and sociocultural environment.

Keywords: higher education, socialization of personality, communication, information technologies.

1.29. Petro Koval. Art as a certain socio-pedagogical system in the training of future specialists.

In the paragraph, the author reveals the importance of the artistic component in the social environment and in the process of training future specialists. It is especially valuable that in today's conditions, art acquires its higher quality and important meaning, which helps to fight against all kinds of social challenges and crisis phenomena. As the authors note, art is an important educational tool that helps create a harmoniously developed person, capable of

creating and not destroying. Therefore, art today acts as an informational and innovative technology both in education and in the social environment.

Keywords: art, social environment, training of specialists.

1.30. Alla Kolyshkina. Development of cognitive activity of primary school students in the process of implementation of the natural educational field.

The paragraph is dedicated to theoretically substantiating the development of cognitive activity among primary school students. To achieve the objective of this publication, various theoretical methods were employed, including the analysis of relevant scientific sources, regulatory documents, and programmatic materials. Additionally, a comparison, systematization, and generalization of both theoretical and empirical data were conducted, aiding in refining the understanding of the concepts of 'cognitive interest,' 'cognitive activity,' and 'didactic game. It is determined that in the process, cognitive activity is considered as a movement of students from ignorance to knowledge, from inability to skill, from random observations to a system of cognition of reality. The individual gains certain experience, develops different ways of acting, enriches himself/herself with new knowledge and skills, without which independent cognition of reality is impossible. That is why cognitive activity is a continuous process of interiorisation (theoretical activity) and exteriorisation (practical activity), but at a higher level. The age and psychological characteristics of junior pupils, which make it possible to use didactic games for the development of cognitive activity in the process of implementing the natural science education, are determined. The dominant (motivational) and secondary (contributing to the development of observation, attention, memory, thinking) functions of the game are highlighted. It is proved that the game as a means of developing cognitive activity can be used to test, consolidate, expand and deepen knowledge.

Keywords: cognitive activity, cognitive interest, motive, natural science education, game, didactic game.

1.31. Nataliia Lakusha, Lesya Chervona. The influence of information and innovation technologies on the system of higher education in Ukraine during the war.

The paragraph examines the influence caused by information and innovation technologies on the system of higher education in Ukraine during the war. The implementation of modern technologies in the educational process, and their impact on learning and knowledge transfer is under analysis. The organization and access to educational resources in higher education institutions of Ukraine located in the territories of conducting (or possibly conducting) military (combat) actions are also considered. The research is aimed at finding out the potential advantages and challenges that information and innovation technologies may have for the system of higher education in Ukraine in the conditions of war.

Keywords: information and innovation technologies, the system of higher education, influence, Ukraine, war.

1.32. Olena Masliuk. The use of information and digital technologies in the organization of laboratory work in chemical disciplines in institutions of higher medical and pharmaceutical education.

The paragraph highlights the importance of digitization of education for the formation of the research mindset of education seekers. The purpose of the paragraph is to study the organization and conduct of laboratory work in the process of teaching chemical disciplines; use of information and digital technologies to support the educational process; virtualization of education as a tool for motivating the cognitive interest of education seekers in research activities. The peculiarities of the use of STEM education in the training of future medical (pharmaceutical) specialists are analysed. Examples of the use of information and digital technologies during laboratory work are given. The advantages and disadvantages of

educational platforms - virtual laboratories and their role in research activities are analysed. Examples of using the Go-Lab ecosystem in teaching chemical disciplines are presented.
Keywords: STEM education, competencies, virtualization of learning, digital learning technologies, distance learning, laboratory work, online laboratories, Go-Lab.

1.33. Natalia Myronenko. Formation of the life competences of future specialists in technological education during the study of professional.

The paragraph deals with the peculiarities of the formation of life competences in future teachers of labour education and technology in the course of studying vocational training disciplines. The paragraph identifies effective methods and strategies that contribute to the formation of life competences in future teachers of labour education and technology, identifies the advantages and limitations of different approaches, which can help to identify the most effective methods and practices to achieve the desired results and develop recommendations and practical tools for teachers aimed at effective implementation of these methods and strategies in the learning process.

Keywords: life competences, future teachers, labour training and technologies, vocational training disciplines, teaching methods.

1.34. Aleksander Ostenda, Yuliana Irkhina, Tetyana Nestorenko, Tamara Kharchenko. Role of internationalization in the national university rankings: a case study of Poland and Ukraine.

The authors examine the national university rankings of Poland and Ukraine for the year 2023, with a focus on analysing the comprehensive indicator of "Internationalization". The research highlights the importance of national university rankings as a tool for analysing and evaluating the higher education system within a country, as well as for self-assessment by universities and making improvements to the higher education system. The study provides examples of national university rankings in various countries, including the USA, Germany, Spain, Italy, Poland, and Ukraine, and underscores the diversity of factors considered in compiling these rankings. The primary objective of the research is to determine the role and weight of factors that determine the level of internationalization in the national university rankings of Poland and Ukraine for 2023. Specifically, the research points out that the comprehensive indicator of "Internationalization" is present in the Perspektywy 2023 ranking for Polish universities, but its weight varies depending on the type of university. In the ranking of Ukrainian universities, "Top-200 Ukraine 2023", such a comprehensive indicator is absent.

Keywords: university, ranking, comprehensive indicator, internationalization, Poland, Ukraine.

1.35. Oksana Pysarchuk. Transformation of approaches to financing institutions of higher education in Ukraine: regional aspect.

The theoretical analysis of the influence of the level of development of education, science, and culture on the formation of human capital and on the potential of socio-economic development of society is carried out. The role of the higher education system and its place in modern society is highlighted. The basic model of financing higher education institutions (HEIs) in Ukraine provides for spending from the general fund and the special fund. An analysis of the use of funds by educational institutions over the past decade showed that the development of higher education institutions is financed exclusively by a special fund. Active hostilities on the territory of Ukraine have a significant impact on all aspects of the socio-economic sphere, including education. The work examines regional features and differences in the activity of the ZVO and the possibility of filling a special fund to ensure its functioning. The clustering of regions was carried out with the formation of a proposal on the specifics of financing higher education institutions of each cluster.

Keywords: general fund, special fund, territorial placement of ZVO, dangerous areas, financing of activities.

1.36. Tetiana Ponomarenko, Tetiana Shynkar, Larysa Harashchenko. Formation of professional skills of future educators of preschool education institutions for the formation of the foundations of social and civic competence of young children.

The study determined the relevance of the problem of developing the professional skills of future educators of preschool education institutions for the formation of the foundations of social and civic competence of young children. The essence of several scientific works related to the investigated problem is characterized. The purpose and task of the research, the content of its main concept determined. Its methodological, theoretical, methodical foundations are outlined. Based on the analysis of the results of the theoretical, methodological, methodical principles, the ascertaining stage of the experimental part of the research was carried out. The peculiarities of the development of professional skills of future educators for the formation of the foundations of social and civic competence of young children within the limits of competences defined in the professional standard of the educator of a preschool education institution have been studied.

Keywords: professional skills, social and civic competence, future teachers of preschool education institutions, young children.

1.37. Valentyna Poul, Tetyana Kolgan. An integral approach in supporting educational seekers of Donetsk region: teletechnologies of adaptation, recovery and development during the war.

The issue of psychological and pedagogical support of educational seekers during military operations within the framework of an integral approach is being updated. An analysis of the introduction of teletechnologies is carried out with the aim of forming integral competence – the ability to solve complex tasks and problems of educational and professional activities, restoring one’s psychological and emotional state in an environment characterized by complexity and uncertainty of conditions. Some examples are highlighted: 1) online technology ”School of safety bloggers”, which promotes social integration of participants in the educational process and allows solving important safety issues at home and in the surrounding environment; 2) implementation of game quest case technology promotes psychological security and safety, adaptation in a new environment.

Keywords: integral approach, integral competence, teletechnologies, telepsychology, adaptation, restoration, support of educational seekers.

1.38. Olga Puliak, Oksana Kireieva. The current state and peculiarities of the formation of gender competence of applicants in higher education institutions of Ukraine.

The paragraph is devoted to the study of the formation of gender competence of future professionals and specialists in Ukrainian educational institutions. The main regulatory legal acts of Ukrainian legislation that ensure equal rights and opportunities for women and men, including access to education and training, are considered. The stages of formation and development of gender competence in a person are presented. The priorities for promoting gender equality and developing gender competencies in the higher education system are identified. The necessary organisational and pedagogical conditions for the formation of gender competence in educational institutions are summarised.

Keywords: gender, gender competence, gender sensitivity, gender knowledge, gender behavior.

1.39. Yana Suchikova, Sergii Kovachov, Oleksandr Nestorenko, Tamara Makarenko. Reflective analysis of modern challenges of higher education in the sphere of nanotechnologies: the Ukrainian context and global perspectives.

This paragraph is dedicated to the complex challenges facing higher education in nanotechnology, particularly in Ukraine, a country currently engulfed in geopolitical instability. The paragraph explores the difficulties of preparing graduates for an uncertain job market through a reflective lens, considering urgent national requirements that demand specialized knowledge. Beyond the Ukrainian context, the paragraph brings the discussion onto a global scale, urging for an immediate yet thoughtful reassessment of how we approach technical education in a rapidly changing world. The piece poses uncomfortable questions and proposes calls to action for policymakers, educators, and the global community. Viewing Ukraine's struggle as a manifestation of a broader global challenge, it seeks to become a catalyst for meaningful discussions and reforms in the approaches to specialized higher education and its implementation worldwide.

Keywords: nanotechnology, higher education, Ukraine, geopolitical crisis, online education, curriculum reform, global challenges.

1.40. Ivan Sadovyy, Mariya Grek, Anna Fedorova. Perspectives of using GIS technologies in education.

People working in many different fields use GIS technology. GIS technology can be used for scientific investigations, resource management, and development planning. GIS is a tool that provides holistic computer and management skills for students, increasingly recognized as a key part of national educational curricula. Teaching of critical spatial thinking in higher education empowers graduates to effectively engage with spatial data. will investigate GIS applications in interdisciplinary research and examine conducive learning approaches. The creation of a unified geospatial database of real and up-to-date data is proposed, which will be used by students of various educational levels in different specialties for collaborative projects. Interdisciplinary research with geographic information systems (GIS) can be rewarding as researchers from different disciplines have the opportunity to create something novel. It is possible that interaction GIS with Artificial Intelligence, robots, augmented reality can increase student motivation, engagement, and attitude towards education. GIS dissemination through distance education in Ukraine can be achieved. While many teachers may lack GIS skills and knowledge, they are often acutely aware of its potential to enhance pupil learning.

Keywords: GIS, collaborative projects, interdisciplinary research, distance education.

1.41. Tetjana Tarasova. Some aspects of the development of creative and critical thinking of schoolchildren and students in the modern educational process.

The paragraph is devoted to the consideration of general psychological and pedagogical approaches to the organization of the educational process in modern educational institutions of different levels. The main attention is paid to the problem of formation of creative and critical thinking of pupils and students, as one of the most important flexible skills (soft skills) of a modern person. It is argued that the achievement of such a result can be provided by a few principles of innovative learning: integration, humanitarization, non-linearity and dilution of levels. It is emphasized that these principles can become especially effective in organic combination with modern information technologies. Such unity should be implemented both in the educational content and in the methods of pedagogical interaction with pupils and students. The further perspective of scientific research consists in the practical study of the effectiveness of the proposed approaches.

Keywords: educational process, principles of education, information technologies of education, educational strategy, pedagogical activity.

Part 2. EMERGING TRENDS IN INNOVATION AND BUSINESS DEVELOPMENT

2.1. Ihor Aliksieiev, Pavlo Horyslavets, Oksana Kurylo, Andriana Mazur. Bancassurance: determinants for development in Ukraine and Poland.

The implementation of bancassurance is one of the promising innovative measures in the financial system of every state. A study of the practice of cooperation between commercial banks and insurance companies proves the effectiveness of such cooperation. A comparison of the experience of Polish and Ukrainian banking institutions cooperating with insurance companies allows us to identify some common characteristics of the activities of such integrated structures, certain achievements of more experienced Polish colleagues, and outline directions for improving the activities of Ukrainian banking and insurance associations.

Keywords: bancassurance, integration of banks and insurance companies, “Allfinanz”.

2.2. Iryna Anhelko. Intrapreneurship as a form of innovation development: basic principles and mechanisms of implementation.

In modern economic conditions, business entities, to remain successful, are forced to respond promptly to challenges and changes in the external environment. As practice shows, internal entrepreneurship can revitalize business and adapting it to new demands and threats of the external environment. Intrapreneurship makes growth possible by making change acceptable. At the same time, it helps companies to innovate, improve internal productivity and stay ahead of the competition.

Keywords: intrapreneurship, intrapreneur, entrepreneurship, entrepreneur.

2.3. Valeria Baranova, Evgeniy Shapran, Andriy Smorodin. The phenomenon of innovative development and modernization processes of Singapore.

The purpose of the research is to study the phenomenon of Singapore, as a unique state in the development and process of information and analytical activity, as well as in the development of information technologies. The phenomenon of Singapore's rapid development, the phenomenon of the most developed and competitive country in the world with a low level of crime and prerequisites for modernization shifts, was investigated using the method of analysis and the statistical method.

Keywords: innovations, innovative development, modernization processes, information technologies, digital transformation.

2.4. Oleksandr Bilotserkivskiy. Selection, implementation, improvement, and economic efficiency evaluation of CRM systems of trade enterprises.

The purpose of the study is to analyse the questions of selection, implementation, and improvement of CRM systems for trade enterprises management. In addition, the methods of economic efficiency assessment for the CRM systems implementation into trade enterprises' activity, which are recommended by foreign and Ukrainian scientists, are considered. To process data from many sources and to select a CRM system, an expert method has been used. After that, the recommendations for implementation and improvement of the CRM systems have been developed. Finally, the methodological approaches to the economic efficiency assessment of implementing the CRM-system into trade enterprises activity have been analysed. The author proposes to evaluate the economic efficiency of the implementation of the CRM systems into trading enterprises activity using indicators such as TCO and NPV.

Keywords: CRM systems, trade enterprises' activity, selection, implementation, improvement, economic efficiency.

2.5. Galyna Chornous, Yuliia Sviatiuk, Daryna Usenko. Hybridization of recommender systems in e-commerce based on demographic filtering.

The study analyses the current state and potential of e-commerce development in Ukraine and the world and justifies the prospects of a hybrid approach to the development of recommender systems. The paragraph highlights the necessity of considering the geographical location of the user of such systems, which is very relevant today, especially for Ukrainian realities, and recommends including demographic filtering methods in the hybrid recommender model. The concept of building such a system is developed on the example of a three-way marketplace, and the results of its practical implementation in Python are presented. The suggested model can be easily integrated into applications or web pages of e-commerce platforms.

Keywords: recommender system, hybrid model, demographic filtering, geographical location.

2.6. Oleksandr Dluhopolskyi, Taras Katola, Tetiana Dluhopolska. The external environment as a driver of innovative changes and the search of new strategic solutions in business: case of TerA company.

The purpose of the paragraph is to study the theoretical foundations of the company's strategic behaviour and to define a model for optimizing the strategic behaviour of the TerA company. To achieve the set goal, the following tasks were solved: an analysis of modern approaches to the formation of strategic behaviour was carried out; the influence of a complex of environmental factors on the strategic behaviour of TerA was investigated; an analysis of the strategic behaviour of the enterprise was carried out using the SPACE-method and the use of game theory. The practical significance of the obtained results lies in the study of the strategic behaviour of TerA as a model object, considering the factors of the external environment, considering the fact that for the successful functioning of the enterprise under significant market volatility, it is necessary to take a particularly careful approach to the formation of the strategic views of managers and the behaviour of the company itself. The approaches and conclusions considered in this work can be used to study and adjust the strategic behaviour of various enterprises to achieve better results of their economic activity.

Keywords: SPACE-method, SWOT-analysis, game theory, strategy, business, SME.

2.7. Iryna Farynovych. Management of financial stability of enterprises in the field of hotel services.

Factors affecting financial stability were studied. The tools for assessing and forecasting the financial stability of hotel business enterprises are defined. Considered factors of interest in consumer loyalty programs of key groups of participants in hotel business enterprises. The proposed model of consumer loyalty management of hotel business enterprises. The evaluation of the effectiveness of loyalty programs of hotel business enterprises in accordance with economic, marketing and communication parameters is presented.

Keywords: management, financial stability, hotel services, consumer loyalty.

2.8. Olha Haponenko, Maryna Mashchenko, Olena Serhiienko. Assessment of volatility and the level of hedging effectiveness on oil markets.

The paragraph defines the practical value of applying multidimensional models of conditional volatility with regard of series to spot and futures WTI and Brent Crude World oil market (beginning 2000-beginning 2023) to calculate hedge ratios. The authors estimate optimal hedge ratios according to the criteria of variance minimize of portfolio and risk in comparison of non-hedged asset. Hedge effectiveness changes when asymmetric characteristic of volatility are considered and size of forecasting window changed.

Keywords: hedging ratio, hedging effectiveness, hedged portfolios return.

2.9. Pavlo Horyslavets, Andrii Mukan. Transfer pricing of TNCs: substantiation of the essence and content.

The international business landscape has witnessed a surge in the operations of transnational corporations (TNCs), which has consequently intensified the scrutiny on their transfer pricing practices. Transfer pricing, the allocation of prices for goods, services, and intangibles within intra-group transactions, holds paramount significance in ensuring equitable taxation and maintaining fair competition in global markets. This paragraph delves into the intricate realm of transfer pricing within the context of TNCs, focusing on the substantiation of its essence and content. Through a comprehensive literature review, this study establishes a solid theoretical foundation for understanding transfer pricing as a pivotal mechanism for profit allocation and risk management within the complex organizational structures of TNCs. The paragraph underscores the significance of aligning transfer pricing methodologies with the economic substance of transactions, emphasizing the role of documentation and contemporaneous records in substantiating the arm's length principle. In conclusion, this paragraph contributes to the existing body of knowledge by providing a comprehensive overview of transfer pricing within the context of TNCs.

Keywords: transfer pricing, transnational corporations (TNCs), arm's length principle, international taxation, profit allocation, intangibles, tax optimization.

2.10. Iryna Khoma. Modeling of innovation results when developing diagnostics' mechanism of economic protectability of enterprise: mathematical and financial apparatus.

The paragraph is devoted to theoretical and methodological foundations of modelling of the results of innovation processes when developing diagnostics' mechanism of economic protectability at business entity in the spectrum of the implementation and use of methods of system-comprehensive and structural and functional diagnostics when controlling generalized condition of protection of business activity in the context of ensuring protectability of innovation, financial and credit and investment activity.

Keywords: innovation process, innovations, enterprise, diagnostics of economic protectability, system-comprehensive diagnostics, structural and functional diagnostics.

2.11. Lev Kloba, Nazar Dobosh, Orysyia Voloshyn. Implementation of innovative products and services – a competitive advantage of the bank.

The authors of the paragraph discuss the role and define the impact of implementing innovative products and services on the competitiveness of a commercial bank. They identify the subjects and objects of innovative activities of a banking institution, as well as highlight the most common types of banking innovations both in global practice and within the banking system of Ukraine. The research authors also outline the requirements that must be met and fulfilled for a banking product to be considered innovative. The study presents the main tools of the bank's communication policy to boost the sale of innovative products. Therefore, in order to meet the aforementioned conditions, banks must develop innovative products that comply with the established requirements for supporting reliability, profitability, and liquidity of investments.

Keywords: innovations, commercial bank, banking investment resources, innovative activity.

2.12. Maria Lapishko, Oksana Sadura, Zoriana Lapishko. Financial and economic implications arising from the russian aggression in Ukraine.

This paragraph delves into the multifaceted economic and financial challenges precipitated by protracted military hostilities within Ukraine, engendering a novel economic and financial crisis. The study meticulously assesses the cost of damages incurred because of armed conflicts, as well as the requisite financial resources to effectuate reconstruction amidst ruinous aftermaths. Furthermore, it scrutinizes the amplitude of international financial assistance extended by benefactors. Objective determinants underscoring the escalation of

state budgetary deficits, defense expenditures, and national security outlays are subject to rigorous investigation. The diverse fountains of budgetary inflows, in tandem with governmental initiatives aimed at surmounting fiscal tribulations, undergo scholarly exploration.

Concomitantly, the strategies deployed by the National Bank of Ukraine and the Government to mitigate economic disparities, curtail inflationary tendencies, and fortify macroeconomic equilibrium within Ukraine are comprehensively systematized.

Keywords: real sector, financial losses, inflation, GDP, budgetary outlays, financial security.

2.13. Tetiana Lysiuk. "Gloomy" tourism: an innovative direction in Ukraine's tourism activity in the face of modern challenges.

The prerequisites for the development of "gloomy" tourism in Ukraine are analysed. The resource base of this type of tourism is studied. Based on monitoring of "gloomy" places and locations in Ukraine, the potentially popular tourist sites are characterised: medieval castles and fortresses, dungeons, thematic museums, prisons, cathedrals, ancient settlements, cemeteries, zones, battlefields of the Russian-Ukrainian war, etc. that can be used in the development of new tourist routes. The geographical and thematic structuring of these objects is carried out, the regularities of their geospatial organisation are revealed. The most interesting objects of dark tourism in each of the macro-regions of Ukraine are allocated and their brief description is provided. Measures to popularise dark tourism in Ukraine are proposed, since dark tourism can be considered one of the leading branches of tourism, which is gaining more and more popularity every year. With changing human preferences and new trends, dark tourism provides tourists with new and unique experiences. The main reasons that encourage tourists to travel to "dark" places are the desire to get new experiences; to learn about the history of their own or any other country; patriotism; adventurism; memory. In the future, the "dark" tourism sector can contribute to the restoration of war-torn territories by selling a specific tourist product to supporters from other countries.

Keywords: "dark" tourism, places of "dark" tourism, "dark" objects, tourist routes, tourist market.

2.14. Taras Ozarkiv. The development of digitalization processes in the financial ecosystem – the experience of Ukraine.

The paragraph reveals how in a resilient display, Ukrainian fintech navigates wartime challenges and sustains impressive growth. Positioned as a leading player within CEE, Ukraine draws investor attention alongside other prominent nations. The sector's strategic focus on technology infrastructure, coupled with regulatory advancements, reflects a promising trajectory, fortified by collaborations with European associations. As Ukraine's fintech sector evolves, opportunities for investment become increasingly compelling.

Keywords: Ukrainian fintech, investor attention, strategy, digitalization.

2.15. Valentyna Sereda, Olena Kuzioma, Iryna Didenko. Ukrainian IT sector: trends and prospects for export promotion.

The state and trends of the domestic IT industry, its place and role for the Ukrainian economy and international economic activity are considered in the study. Weaknesses and challenges of the IT sphere that might affect home IT industry further development are outlined. Possible ways to solve the existing problems of the IT sector in the context of economic growth in Ukraine are proposed.

Keywords: ICTs, IT companies, IT market, Computer Services Export, IT outsourcing.

2.16. Iryna Yaremchuk, Khrystyna Gorbova, Liliia Grynash. Innovative development of enterprises and justification of the main methods of economic efficiency of these enterprises.

Innovations are a key factor in the competitiveness of enterprises at the macro- and micro-level in the conditions of the global economic crisis and limited factors of extensive development. To achieve both economic growth and scientific and technological progress, it is necessary to have the ability to create and use innovations. In today's world, innovation has a significant impact on every aspect of the development of human society. This includes changing the very environment of a person's life and activities to ensure his existence and development. Innovation is the main way for enterprises to adapt to constant changes in the external environment. The process of implementing innovative projects is complex and diverse, so it is necessary to carefully study the concept of the category apparatus of this activity and create a scheme of the relationship of these categories.

Keywords: innovations, innovative activity, investments, efficiency, innovative enterprise.

2.17. Svitlana Zaika, Oleksandr Hridin, Olena Zaika. Historical milestones and prospects of innovative technology development in agricultural production.

The changes in societal development have led to the emergence of a new model of innovative transformation, which differs from previous stages of development by prioritizing certain aspects such as improving quality of life, enhancing the intellectual component within enterprise capital, and preserving the environment. Therefore, important aspects of post-war country recovery, overcoming economic backwardness, and achieving socially oriented development will involve the application of innovations, the implementation of resource-saving technologies, and the production of ecologically clean agricultural goods. These actions will contribute to creating competitive advantages for agricultural producers. The development of the agricultural sector in the third millennium must be grounded in an innovative model, as it is vital for its efficiency. Research aimed at identifying the prospects of innovative agricultural development within the context of sector efficiency enhancement has been conducted. It has been revealed that innovative development in the agricultural sector entails structural reformation across all domains, the integration of scientific and technological progress achievements, and the utilization of advanced experience in economics and production organization.

Keywords: innovations, agricultural production, innovative development, innovative technologies.

2.18. Roman Zelizniak, Olena Pozniakova. Tax tools as an incentive for business innovation.

The paragraph raises the issue of the need for tax incentives for innovation. The role of tax incentives for innovation for the development of the country is highlighted. The financial sources of innovative activity of enterprises are specified. The direct and indirect influence of the State is proposed to be considered both at the micro level and at the level of the region and the State. Of particular importance are the innovations related to the military and security sphere, which are proposed to be attributed to the strategic directions of innovative development with a high level of tax incentives. A cluster approach to grading tax incentives for innovation is proposed.

Keywords: tax support, innostate technology support; stimulation of technological renewal; tax incentives; technology taxation.

2.19. Vita Bugaychuk, Inna Grabchuk, Karyna Sych. Economic advantages of green building in the field of energy efficiency and energy saving.

The purpose of the paragraph is to determine the priorities for the development of green construction as an innovative direction of economic policy in the field of energy efficiency and energy saving. The authors also investigated the economic, ecological and social

foundations of the field of green construction in the context of sustainable development of society. It was found that the concept of green construction has been developing quite intensively during the last decade. Special attention was focused on Ukraine, a candidate country for joining the EU, and it was determined that the first certified green buildings are already in Ukraine, but so far they are mainly business buildings. In addition, it was established that residential real estate is next in line, because green construction not only reduces the burden on the environment and increases energy efficiency but is also directly focused on the quality and comfort of buildings, which has a positive effect on people's health.

Keywords: green construction; technological, economic, energy, environmental and social efficiency; economic advantages.

2.20. Vasyl Gorbachuk, Maksym Dunaievskyi, Maxim Lupey. Innovative approaches to measuring system resilience.

Modern information and innovation technologies depend on energy supply by contemporary energy systems, which, in turn, widely use information and communication technologies. The successful application of information and innovation technologies implies certain resilience, reliability, robustness, viability, flexibility, agility, fault tolerance, reactivity to vulnerability and risk for energy systems. An innovative approach to measuring indicators that correspond to these concepts is suggested, based on temporal and spatial decomposition of disruptions.

Keywords: resilience curve, residual demand, disruptions, system abilities.

2.21. Iryna Yemchenko. Changes in consumer buying behaviour during the war in Ukraine.

The paragraph shows the impact of changes in the economic, social and political spheres that occurred during the war that began in 2014 in Donbas, on the purchasing behaviour of consumers. It was determined how the events of the war influenced the formation of new consumer patterns among Ukrainians. The multi-vector nature of research by Ukrainian and foreign scientists and practitioners from various fields is shown psychologists, marketers, commodity experts, economists, sociologists, etc. The paragraph reveals the essence of changes in the attitude of consumers to expenses. The main priorities of consumers, which changed during the war period in Ukraine, are also determined. Factors influencing consumer behaviour have been identified, including the motivational component of purchasing goods. Dominant needs in goods and services, value orientations of buyers, influence of emotional and psychological state on shopping, cognitive aspects, behavioural habits, etc. are given. The features of consumer behaviour during the period of martial law in Ukraine are shown in the aspect of understanding the impact on the economy, society, and citizens. The optimal ways of responding and supporting the Ukrainian community are outlined.

Keywords: consumer purchasing behaviour, product, military status, motives of behaviour, consumer priorities, consumer behaviour pattern.

2.22. Liudmyla Zveruk, Yulia Morgun. Innovative approaches to improving the crisis management of banking institutions.

The development of digital and innovative technologies provides banking institutions with a key advantage in preventing internal and external financial risks. Effective management of banks' anti-crisis activities is based on the use of modern technologies and the possibility of their implementation in the financial, marketing and management environment of the bank. The introduction of high-quality infrastructure and modelling technologies is an advantage for banking institutions. Modern banking activities are carried out on the basis of cloud technologies that secure them in the digital space. Digital tools in the crisis management mechanism include cloud services, crypto-encryption and crypto-planning, strengthening of remote communication channels, cybersecurity systems, online lending, use of container systems, and expansion of the product line of digital services. The most effective approach to

crisis management is the dualistic approach, which allows identifying risks and outlining the development prospects of banking institutions. As banks are transforming into high-tech institutions that use artificial intelligence, innovative crisis management methods and reporting automation, a new model of banking business is being formed based on the creation of digital banking platforms that can interact with other digital platforms (production, trading, social). The development of digital banking platforms can be viewed as a new innovative strategy for organising banking business, which will allow banks to ensure high efficiency of crisis management and activities in general.

Keywords: cloud technologies, digital infrastructure, innovation, cybersecurity.

2.23. Nataliia Lysiak, Nataliia Samotiy, Yana Pecheritsa. Forecasts and tasks of post-war reconstruction mist – regional centers of Ukraine.

The processes and changes in urban planning and the industrial sector of Ukraine are characterized, considering new realities. The study utilizes theories, methods, and practical principles of the impact of wars and conflicts and assesses their consequences on cities. Five key tasks are identified that will require solutions in the immediate post-war perspective: the restoration of damaged infrastructure, the enhancement of economic productivity and the economic role of cities, the return of people and the reconstruction of human capital, urban population reform, and the creation of incentives for attracting investments and entrepreneurship. Proposed mechanisms for addressing these tasks will lay the foundation for long-term economic growth, attracting foreign capital and technology, and making cities economically viable, strong, and self-sufficient.

Keywords: urbanization, economic recovery, industrialization, urbanization policy, spatial organization.

2.24. Nataliya Loboda. Digital technologies in the paradigm of harmonization of the national accounting system with accounting practices of the European Union.

The purpose of the research is the peculiarities of the use of digital technologies in the period of accounting harmonization in the conditions of European integration. The paragraph examines and substantiates the problems of implementing these programs at domestic enterprises to increase their competitiveness and economic efficiency of operations in modern conditions. The main measures for effective accounting are highlighted and the main steps of their solution are analysed. Measures and directions are proposed for the implementation of digital technologies in various spheres of activity, in particular, accounting, which is a central component of the management system of any object.

Keywords: accounting, European integration, blockchain, electronic document management, digital signature, cloud service.

2.25. Petro Pererva, Maria Maslak, Andrii Ievsieiev. The study of methods for valuation of intellectual property rights.

Based on the legal foundations of the existing normative legal documents, the paragraph examines the theory and practice of valuation of objects of intellectual property rights. The authors recommend using three main (basic) approaches to the assessment of property rights of intellectual property objects: income (profitable), comparative (market) and cost, each of which has its own varieties, its advantages and disadvantages, its areas and directions of use. The justified possibility of using a complex (integral) approach to the valuation of intellectual products using all basic concepts of valuation, which allows obtaining the most objective value of intellectual property objects.

Keywords: intellectual property, valuation, methods

2.26. Olha Tkachenko. Use of innovative technologies in personnel management.

The paragraph substantiates the necessity of using innovative technologies in personnel management of the enterprise under modern operating conditions. The main modern trends in the application of innovative technologies in personnel management are considered. Innovative personnel management technologies are systematized according to the functional areas of personnel management: recruitment, selection, and dismissal of personnel; personnel adaptation, performance evaluation and certification, training and professional development, motivation, business career management.

Keywords: innovations, personnel management, innovative technologies in personnel management.

2.27. Leonid Tsubov, Taras Shcherban, Oresta Shcherban. Theoretical and analytical study of marketing activities of the bank.

In this paragraph, there is a theoretical and analytical analysis of the marketing activity of the bank. Theoretically approached to the end of the essence of the concept of "bank marketing". It has been shown that the method of marketing management of the development of the banking business is to cut the profit for the additional recruitment of marketing approaches, thus increasing the obligation to sell banking products. An important task of today's marketing is named - ensuring the processes of introducing new tools for the follow-up and automation of banking operations and technologies. The essence of banking marketing is explored for additional detailed characteristics of its principles and functions, to which the main principles of banking marketing functions are considered. The need for a comprehensive marketing approach for the bank to the management of banking activities is substantiated, in order to give the client the best possible understanding of the client's needs and to know the best solution for satisfying their needs. As the first and the most wide-ranging marketing tool for promoting the market of banking products and services – SWOT-analysis, SWOT-analysis was carried out by AT "Ibox Bank". For a re-analysis, the feasibility and threats, as well as the strengths and weaknesses of AT "Aybox Bank" were taken into account. In the deposit, the type of interleaving of warehouse SWOT-analysis was requested by the bank's dial-up strategy. Considered to ensure the effectiveness of the marketing approach to the management of the dealership of AT "Aybox Bank". It has been brought to the attention of the marketing pidhid to the management of the dialing of AT "Aybox Bank" to allow: to tighten the respect of potential customers, to arouse interest in the products promoted by the bank and services, sfo reconciliation according to the dotility of the choice of this bank, want the client to be buried with the bank, prompt the client to die – before purchasing products and services to the bank.

Keywords: banking marketing, marketing activities for a bank, marketing management, marketing pidkhdid, marketing technologies, SWOT-analysis.

2.28. Odarka Chabaniuk. Types and procedure of drawing up regulated reporting in the conditions of modern information technologies.

The purpose of the study is the peculiarities of the formation and presentation of regulated reports in the conditions of the application of modern information technologies. The list of tasks for informatization of accounting processes, which are solved with the help of "BAS Accounting", has been considered. The paragraph examines step-by-step filling of regulated reports in one of the automated accounting systems "BAS Accounting". The structure of the "Regulated Reports" directory is considered. Attention is paid to the capabilities of the user and the program during the formation of regulated reports regarding the reporting period, auto-completion, viewing indicators, data correction, printing reports, extension formats when exporting reporting files.

Keywords: accounting, reporting, regulated reporting, financial reporting, information technologies.

2.29. Olena Serhiienko, Ihor Sosnov, Pavlo Samus. Modelling technologies in the study of taxpayer behaviour to develop effective tax strategies.

The paragraph is dedicated to the pressing issue of studying taxpayers' behaviour, which can be utilized in the development of effective tax strategies. An approach to modelling taxpayers' behaviour is proposed, allowing for the assessment, analysis, and exploration of causal relationships between tax burdens, potential penalties, and bribes. Three stages have been implemented: the construction of conceptual models of taxpayer behaviour scenarios, the development of a dynamic analytical model, and the creation of a simulation model of taxpayer behaviour. A series of experiments were conducted to determine the cause-and-effect relationships between tax policy and the benefits of tax evasion for taxpayers, using tax rate indicators, penalty rates, bribery rates, and income levels. The constructed model can be used for monitoring and analysing the consequences of tax legislation reform and predicting taxpayer behaviour under different conditions of tax policy.

Keywords: tax, taxpayer behaviour, tax load, net income, simulation model, scenario.

Part 3. INTERDISCIPLINARY APPROACHES TO RESILIENCE, INFORMATION IMPACT, AND ENVIRONMENTAL ASSESSMENT IN THE CONTEXT OF SOCIETAL CHALLENGES

3.1. Iryna Bulakh, Valentina Voloshyna, Hanna Varina. Psychological features of the development of resilience in internally displaced persons as a resource for overcoming the trauma of war.

The paragraph examines the psychological characteristics of individuals who were forcibly displaced because of full-scale military aggression on Ukraine's territory. The foundations of resilience's concept are revealed. The paragraph details the manifestations of survivor's guilt syndrome, victim syndrome and identity crisis in IDPs. It was found that the term "resilience" in foreign literature is defined as the understanding of a person's ability to overcome difficulties in adverse life circumstances, the ability to maintain psychological balance during potentially dangerous situations. The paragraph revealed that the phenomenon of "resilience" is a category of human internal resources: a person's ability to emotional self-regulation in stressful situations, the degree of physical, mental, and psychological viability. However, the concept of 'resilience' naturally incorporates external factors that influence human behaviour, in particular, social ones.

Keywords: resilience, resilience, traumatization, forcibly displaced person, resourcefulness, stress resistance, personal identity.

3.2. Olga Kovalova, Ella Eminova. Information and psychological impact on society in the context of war in Ukraine.

The paragraph analyses the unique aspects of information and psychological influence on society in the context of the war in Ukraine. The concepts of "information-psychological warfare" and "information-psychological operation" as forms of resistance to information-psychological influence are considered. The methods of influencing society are also considered, including suggestions or indoctrination. The peculiarities of the psyche of an individual as a unit of a group/mass are considered. Attention is focused on the peculiarities of behaviour and general characteristics of the mass from the point of view of social psychology. The relationship between the concepts of "information and psychological influence" and "masses" is established. In the context of their interaction, the author clarifies the danger of information and psychological influence on society in the context of a full-scale war in Ukraine and its consequences in the future.

Keywords: information and psychological influence, information and psychological warfare, information and psychological operation, psychology of the masses.

3.3. Yuliia Kurylchyk, Marta Mashevska. Ecological safety assessment system of the rivers in Lviv region based on fuzzy logic model.

The main purpose of developing the ecological safety assessment system of the rivers in the Lviv region is to ensure control over the state of water resources and an immediate reaction to possible threats to human health and the natural environment. This paragraph describes the implementation of a web-oriented system for assessing the environmental safety of the rivers in the Lviv region which is built using the Model View Controller programming model and the fuzzy logic model. The analysis was performed and a reasonable selection of the key factors and adverse conditions affecting the state of the rivers was made to build this assessment model. A rule base for logical inference was formulated and implemented for the fuzzy model of assessing the ecological safety of the rivers. As a result of the implementation of this system, it is possible to ensure water quality improvement and the preservation of river ecosystems in the region.

Keywords: fuzzy logic, rivers, assessment model

3.4. Andrii Lagun, Nataliia Kukharska. Using the information technologies for quality monitoring of different environmental impacts on humanity life.

In this paragraph, we study methods of environmental monitoring using modern information technologies. These problems consider and research students of the Information Systems and Technologies Department of the Enterprise and Advanced Technologies Educational and Scientific Institute of the Lviv Polytechnic National University. After completing the educational program "Computer ecological and economic monitoring", specialists can work in IT companies and any enterprises that develop and use environmental monitoring systems to reduce negative environmental impacts on people's lives. Also, in this monograph we carried out an analysis of existing monitoring systems for air pollution, water objects, radiation pollution, the quality of land of agricultural enterprises and private farms. We research different monitoring systems of forest lands and development of flora and fauna of nature reserves.

Keywords: computer science, environmental monitoring, information technology, pollution, chemical composition of air, soil monitoring, water object, nature reserve, software.

3.5. Iryna Ostopolets, Olesia Prokofieva, Liliia Kobylnik. Professional deformations and frustration of teachers as a social problem.

The paragraph presents the results of a study of the peculiarities of the emergence and development of professional deformations and frustration of secondary school teachers with different lengths of service. The theoretical and methodological concepts of professional deformations of the personality and their varieties in the modern scientific discourse are briefly described. It has been established that professional deformations are the most common phenomenon in the field of socio-economic professions, among which teaching is characterized by great psycho-emotional stress and frustration. Empirical studies have shown that professional deformations are common among teachers with different durations of service, characterized by distortion of self-attitude, motivation, cognitive and communication processes, emotional and behavioural reactions. This requires optimization of the teacher's work, development of psychoprophylactic measures, implementation of programs to overcome teacher frustration, which is one of the causes of the emergence and development of professional deformations.

Keywords: professional deformation, pedagogical activity, self-attitude, frustration, frustration reactions of teachers.

3.6. Hanna Varina, Svitlana Shevchenko. Implementation of coaching technologies in the practice of psychological counselling.

The paragraph examines the peculiarities of integrating coaching technologies into the consulting process in the field of business and management. Modern approaches are examined to determine the role of coaching in the system of effective human resource management. Various coaching models are analysed through the prism of their ergonomics and efficiency of implementation in the consultation process.

Keywords: coaching, psychological counselling, personal resource, GROW model, SUCCESS model, SCORE model.

3.7. Nataliia Svitlychna, Vasyl Matukhno, Mykhailo Dolhodush. Theoretical analysis of the influence of voluntary regulation on the professional adaptation of employees of the state emergency service of Ukraine.

Volitional regulation and professional adaptation play an important role in a person's life. The volitional regulation of control over the execution of an action consists in the fact that a person consciously forces himself to carefully check the correctness of the performed actions when the strength and desire to do it are almost gone. The process of adaptation is also a necessary, although not sufficient, condition for successful human activity, in particular employees of the State Emergency Service of Ukraine. The question of achieving the pinnacle of professionalism at all times and in all professions occupies a leading position. Today, the problem of studying the factors that can determine the high level of professional activity of employees of the State Emergency Service of Ukraine is particularly relevant.

Keywords: will, volitional regulation, professional adaptation, lifeguard, employee of the State Emergency Service of Ukraine.

3.8. Alexander Sklyarenko. Innovation is the way of development and its strategic significance for society.

The paragraph examines the essence of the concept of “innovation”, its influence, functions, and role in the development of the economy, science, education and society. The work highlights the fundamental components of the innovative economy as a basis for the future growth and development of all spheres of life in society and the state. The innovative orientation of economic development is based on the concept of scientific and technological progress, which is the basis of modern extended reproduction. The paragraph analyzes and interprets in general terms the historical aspect of innovation, which will contribute to the accumulation of knowledge, the study of innovation policy, and the creation of prerequisites for forecasting the further development of Ukraine. Proposals were made to improve the state of innovation.

Keywords: innovation, innovativeness, economy, humanitarian development, education, science, scientific and technical development.

3.9. Lesia Uhryn. Mathematical modelling of the assessment of territories state for the nature reserve fund of national significance.

The issue of environmental security of territories has always been relevant. And the issue of the human condition as a part of the socio-ecological-economic system was brought to the fore. During the war, it acquired special importance. It is necessary to research and develop territories where it is possible to improve the state of health, as well as carry out the rehabilitation of military personnel. Thanks to scientific research, resorts of local importance, as islands of ecologically clean territories, can acquire state status and thereby attract more investment for their development. The paper explores the possibility of creating a mathematical model for assessing the state of ecological security of the territories of the

nature reserve that have the status of national importance and its further use for forecasting the state of the ecosystems of these territories with the help of information systems.

Keywords: process modeling, environmental safety, the theory of Markov chains, Kolmogorov's differential equations.

Part 4. ARTIFICIAL INTELLIGENCE IN EDUCATION, HEALTHCARE, AND SOCIETY: OPPORTUNITIES AND CHALLENGES

4.1. Iona Boichevska. Artificial intelligence – friend or foe for Ukrainian students.

The paragraph deals with the concept of artificial intelligence (AI) and its use in the educational process in Ukrainian universities. The purpose of the paragraph is to analyze the introduction of AI into the learning process and characterize its potential advantages and drawbacks. It has been stated that nowadays educators face increased use of AI by students performing educational tasks in higher education institutions and therefore there is a problem with defining students' own level of creativity and independent thinking. AI-powered adaptive learning platforms and tools, AI-driven tutoring systems, AI-powered language translation tools, aid in conducting research, analyzing data, and generating insights, and accessibility for students with disabilities are mentioned among the most significant advantages of AI use in the educational process. The author emphasizes, that whatever the benefits of AI are, it is crucial not to forget about responsible and ethical AI integration in the educational system as well as the importance of critical thinking, creativity, and social-emotional development and alongside the use of AI tools. The paragraph concludes that artificial intelligence is a major influence on education today which can transform the education system's functioning, increase institutions' competitiveness, and empower teachers and students at all levels but its implementation should be thoughtful and ethical.

Keywords: artificial intelligence, educational process, ChatGPT, AI-powered tools and platforms, AI-powered language learning tools, AI-powered language translation tools, critical thinking, creativity.

4.2. Ievgen Sidenko, Oleksandr Malimon. Recommendation system for movie selection using artificial intelligence.

This work is related to the development of a recommendation system for selecting films based on artificial intelligence. The work consists of an introduction, three sections and conclusions. The first section reveals the importance of recommendation systems in the modern world. The second section describes the existing technologies and algorithms, and performed a comparison of methods in order to identify shortcomings. The third section describes the design and software implementation of the developed system. The purpose of the work is to improve the process of providing movie recommendations by creating a system and a client application.

Keywords: recommendation system, artificial intelligence, collaborative filtering, movie selection.

4.3. Tetiana Tkachenko, Oleksandr Hladkyi, Valentyna Zhuchenko. Opportunities and threats of artificial intelligence development in cities.

The features of Artificial Intelligence Development in Cities in the era of post-society formation are considered. The Opportunities and Threats of this development are described. There are 3 stages of cities transformation under the influence of Artificial Intelligence: 1) the development of globalization and IT; 2) dissipation, modularity, and universality of technologies; and 3) the atomicity and protonic disintegration of post-society. The main

consequences of cities transformation process under the influence of Artificial Intelligence are determined. The prospects of cities development as well as of certain branches development in city economy and of urban territorial community development in the era of post-society formation are highlighted.

Keywords: Artificial Intelligence, post-society, cities, globalization, IT, dissipation, modularity, atomicity, protonity.

4.4. Yue Zheng, Oleksiy Kozlov, Chenjian Dong. Features and prospects of automation of complex dynamic processes based on modern intelligent control and decision support systems.

This study considers the problem of creating and implementation of the modern intelligent control and decision support systems for automation of complex dynamic processes in different industries. The main properties of complex dynamic processes are identified and analyzed, and the main tasks of their automation and control are formalized. The expediency and prospects of using intelligent systems based on soft computing, fuzzy sets, and fuzzy logic, artificial neural and hybrid neuro-fuzzy networks are substantiated. The possibilities and features of the use of intelligent systems and individual control devices are considered at different hierarchical levels of control: higher, strategic, tactical, and executive. Also, the basic principles of functioning of existing modern intelligent systems of various types and configurations are analyzed, which are used to solve a wide range of tasks (control, identification, forecasting, diagnostics, modeling of phenomena, classification, etc.) in different industries.

Keywords: automatic control system, decision support system, intelligent methods, fuzzy logic, artificial neural network, hybrid neuro-fuzzy network.

4.5. Iryna Shvetsova. The use of artificial intelligence in education as an effective tool for developing foreign language communicative competency.

The purpose of this publication is to analyse the possibility of using artificial intelligence as a means of developing the foreign language communicative competence of specialists in ship handling and ship management in the context of continuing education. The objectives of the paragraph are to identify the potential benefits of using AI for the development of foreign language communicative competence; to provide examples of the use of AI in the process of teaching Maritime English; to identify tasks for further improving the use of AI as an effective educational tool. Among the proposed examples of AI application in the educational process for the development of foreign language communicative competence of navigation and ship handling specialists were the following: development of web-based learning resources, transition to personalized learning; development of testing and diagnostic systems; organization of online education and use of web platforms; use of VR-TECH in practical classes in maritime English.

Keywords: artificial intelligence, foreign language communicative competence, active technologies of teaching English, maritime English.

4.6. Olha Kovalova, Tetiana Martynova-Hanetska. Artificial intelligence and neuro-training for children with developmental difficulties. When technology helps.

Innovative technologies such as artificial intelligence (AI), deep learning, machine learning and optogenetics are considered key components contributing to the acceleration of numerous discoveries in the life sciences, particularly in the field of neuroscience. Given the inherent development of artificial intelligence it is not surprising that "neuroscience", the comprehensive study of the nervous system, can benefit from the endless possibilities offered by AI through the augmentation of the human mind. Our mental capacity is impressive, but there is a limit to the amount of information we can mentally process. Along with advances in

artificial intelligence systems, we can push neuroscience forward and unlock the mysteries of the human brain, one of the applications of which is the ability to identify neurological problems and detect neurotransmitters. The possibility of using AI to diagnose and treat neurological disorders is one of the most important prospects for neuroscience and AI development. Machine learning algorithms can be trained to recognize patterns in brain scans that may indicate the presence of diseases such as Alzheimer's, Parkinson's, or multiple sclerosis. This could lead to the detection of the disease at an early stage and the development of more effective treatment strategies, which would improve the quality of life for millions of people around the world. There is great promise in the detection and early neurocorrection of children with autism spectrum disorders. With the help of AI, certain deviations from the norm can be detected at an early stage and brought up for collegial discussion, and all possible measures can be taken to prevent the manifestations of this type of disorder from deepening.

Keywords: Artificial intelligence, neurodiagnostics, neurocorrection, machine learning, brain, EEG, rehabilitation.

4.7. Jevgenija Nevedomsjka. Advantages and dangers of artificial intelligence in medicine.

Artificial intelligence has rapidly entered the life of humanity, and of each person. This is because artificial intelligence and artificial neural networks are similar in the principles of information encoding and functioning to biological neural networks. Neural networks have absorbed the main features of a person – the ability to learn, the ability to adapt to different and changing conditions, draw logical conclusions from a large amount of information, practically think, having an unlimited, incomparably greater reserve of memory and knowledge, than even a professional in his case. The paragraph reveals the concepts of «artificial intelligence», «artificial neural networks», «neurocomputer», «chat bots» and makes a brief historical sketch of the development of artificial intelligence. The possibilities of artificial intelligence in medicine, as well as its advantages and possible dangers, are considered.

Keywords: artificial intelligence, artificial neural networks, neurocomputer, chat bots.

Part 5. ADVANCEMENTS IN PHYSICAL EDUCATION AND REHABILITATION: THEORY AND PRACTICE

5.1. Karen Abramov, Oksana Petrenko. Teaching 7-8-year-olds breathing techniques while swimming front crawl.

The purpose of the study is to analyse approaches to teaching breathing techniques while swimming front crawl and to check the effectiveness of proposed methodology for 7-8-year-old swimmers. 24 children participated in training sessions in Mykolaiv sport complex «Zoria». They were divided into two groups (A and B), 12 people in each, for swimming sessions, which lasted 60 minutes and gym trainings, which lasted 30 minutes. The trainings were held three times a week for two months. Group A was taught synchronizing legs with breathing and hands with breathing using a traditional approach to teaching these movements (turning the head while inhaling). Group B was taught according to the author's methodology (using side swimming). The obtained results showed quicker acquiring of the technique and its better performance by group B swimmers.

Keywords: breath, body position, inhale, exhale, coordination of movements, axis.

5.2. Volodymyr Kylivnyk, Oleksandr Hladkyi, Yaroslav Luchenko. Medical rehabilitation in Podillia (Ukraine): experience of creation and prospects of development.

Key issues of the medical rehabilitation development in Podillia and in Ukraine at large are considered. Basic provisions of the M.O. Bernstein's theory and practice of the level organization of motion are given. The motion levels and characteristics essentially important for physical rehabilitation are indicated. The classification of assistive devices, strategy of providing them to patients, the barriers for people using these devices are described. The main provisions of the concept of forming a network of rehabilitation centres in Ukraine are disclosed.

Keywords: rehabilitation centres, Ukraine, Bernstein's theory, assistive devices, Podillia.

5.3. Viktoriia Babalich. Modern approaches to the prevention of sports injuries.

The paragraph discusses the issue of approaches to the prevention of sports injuries. It has been established that the level of injuries among athletes has been steadily increasing recently. Such a trend requires the attention of doctors and coaches, which consists in carrying out effective preventive measures aimed at reducing sports injuries. During the study, the causes of sports injuries were determined, and the means of prevention and rehabilitation were analysed, among the proposed ones were the following: stretching, taping, means for external use (warming, cooling, pain-relieving and anti-inflammatory drugs), bandages, orthoses.

Keywords: sports injuries, athletes, prevention.

5.4. Alona Vitchenko, Liudmyla Lysenko. Methodological support for the implementation of the integrated technology for the formation of health-saving competence of primary school children in the process of physical education.

The paragraph deals with the methodological support of the implementation of the integrated technology for the formation of health-saving competence of primary school children in the process of physical education, based on the integration of views, values, ways of thinking, knowledge, skills, skills aimed at the formation, preservation and strengthening of health - their own and others. The complex of methodological support provides for the introduction of cognitive-motor and breathing exercises in the lesson of physical culture, independent physical exercises, physical education minutes in general education lessons, active breaks and extracurricular activities in physical education.

Keywords: health-saving competence, integration, integrated technology, methodological support.

5.5. Olena Dmytrotsa, Olha Korzhyk, Victoria Demchuk. Assessment of teenagers' physical health indicators in terms of distance learning.

Modern realities in Ukraine are a challenge for the daily life of schoolchildren. Long-term distance learning has changed their lifestyle, which will have a negative influence on their health. The purpose of the research is to study some indicators of the schoolchildren' physical health in terms of distance learning. 120 people (12-13 years old, both sexes) participated in the research. All the participants have been divided into two groups relating to the type of learning: distance learning and traditional learning. Commonly accepted methods of anthropometry have been used to calculate physical health indices. Based on the study results, it has been established that teenagers, who had a traditional learning type, had higher growth and vital capacity of the lungs. Distance learning girls had significantly higher body weight and chest circumference. Body mass index is lower among girls who had a traditional learning; the vital index in all examinees is low.

Keywords: distance learning, physical health, teenagers.

5.6. Yaroslav Krenevych, Dmytro Starokadomsky, Mariia Reshetnyk, Nataliia Bodul. Impact of additives of 12.5 wt% micro-nano-pparagraphs of metals (Cu, Fe, Al) on the power of epoxy composites for sports and rehabilitation materials.

It has been experimentally shown that the addition of 12.5% by mass of micro-nano-pparagraphs of metals leads to the formation of compositions colored according to the metal (black - iron, bronze - copper, silver - aluminum) with high fluidity. They harden with a slight (compared to unfilled) shrinkage, which increases in the range of composites Aluminum, Copper <Iron< Unfilled. All fillers made it possible to increase the fire resistance of composites twice or more (with copper). The filling can significantly affect the physical and mechanical parameters of the obtained composites. Thus, compressive strength, abrasion resistance and tear adhesion to steel are significantly enhanced when Aluminum is added; shear adhesion is significantly enhanced for Midi; microhardness increases significantly, especially when iron is added. The introduction of dispersed iron and copper (in the late stages of 10-15 days) weakens the activity of swelling in hydrogen peroxide concentrate (50%), unlike aluminum. Aluminum composite is the least resistant to swelling in a strong oxidizer. It can be assumed that this is a consequence of the increase in resistance to oxidation (in particular, peroxide solution) in the series Al<Fe<Cu. Filling also increases resistance to swelling in acetone solutions (for example, a mixture of acetone and ethyl acetate). In acetone solutions (where epoxy composites are destroyed in 1-2 days), on the contrary, Aluminum provides the greatest stability of the composite (does not destroy at all). The experiment shows that the simple method of filling epoxy resin with micro-nano-pparagraphs of metals makes it possible to obtain stable and strong composites that can be used for various needs of industry, household, and service.

Keywords. Epoxy, nano-micro-pparagraphs of metals, strength, stability, filling, reinforcement of the composite.

5.7. Olena Nievorova, Valentyna Cherniy. Theoretical aspects of teaching students to provide home medical aid at lessons on defense of Ukraine.

The paragraph examines the problem of teaching schoolchildren the methods of providing pre-medical care in the lessons of the basics of medical knowledge and the application of the competence approach in this direction. The analysis of scientific sources showed that school education plays an important role in the formation of readiness to provide pre-medical assistance to a victim in an emergency situation; the learning process will be carried out most effectively through the use of a wide arsenal of pedagogical forms and learning methods, which will contribute not only to the formation of knowledge, but also to the readiness to apply it in practice; in the process of studying the basis of medical knowledge. The main emphasis should be on the formation of personal, cognitive, regulatory and communicative competences.

Keywords: training, provision of pre-medical care to victims, types of pre-medical care, pedagogical competences, health care.

5.8. Oksana Polianska, Igor Polianskyi, Olha Hulaha, Inna Moskaliuk. Implementation of the newest technologies in rehabilitation.

The achievements of modern medical science pose several problems for education, among which is an increase in the amount of information, modern methods, and new equipment that a rehabilitation specialist must master. The great need for carrying out rehabilitation measures for military, wounded and internally displaced persons requires a new, modern approach to the presentation of material and the acquisition of certain competencies. The use of modern methods of physical therapy, verticalizers, computerized devices, exoskeletons make it possible to improve or restore the patient's functioning.

Keywords: rehabilitation, competencies, physical exercises, verticalizers, rehabilitation specialists.

5.9. Iryna Sundukova, Oleksiy Stasenko. Peculiarities of the development of gnuchkost and methods of її thoroughly among students in the lessons of sports gymnastics.

In the paragraph the concept of «flexibility» is shown, which is characterized by the degree of friability of the legs of the supporting-ruby apparatus and the building of the ruhi with a great amplitude. Designated as one of the factors, which positively affects the friability in the swamps, it reduces the weakening of the mud. Two types of gnuchkost are characterized: active and passive. Under the active gnuchkisty, it is possible to understand the maximum possible friability in the snowdrifts, which the student can show on his own, without outside help, victorious only by the strength of his m'yaz iv. Pasivna gnuchkistnost is characterized by a greater amplitude, as it is possible to reach for the rahunok of the outer forces, which are created by a partner or by tightness. A complex of physical rights has been grounded for the full flexibility of students in the classes of sports gymnastics.

Keywords. Gnuchkist, sports gymnastics, physical right, smart smart.

5.10. Olga Shevchenko, Anastasia Melnik. Development of coordination of movements in sports-pedagogical improvement classes in artistic gymnastics.

The paragraph presents the results of a scientific study on the development of coordination abilities in female athletes in rhythmic gymnastics classes. It has been found that coordination abilities ensure the economical use of energy resources, affect the amount of their use, since precisely dosed in time and space, muscle effort as it fills up and optimal use of the corresponding phases of relaxation lead to a rational use of strength. It has been proven that in artistic gymnastics, the ability to reproduce, differentiate, measure and evaluate spatial, temporal and force parameters of movement, actions or activities in general, based on accuracy and subtlety, specialized perceptions.

Keywords: coordination of movements, abilities, artistic gymnastics, female athletes.

5.11. Oksana Yazlovetska, Nataliia Shcherbatiuk, Serhiy Sobko. Modern technologies of physical culture as a component of the educational process of general secondary education in Ukraine.

The paragraph presents theoretical aspects of the use of modern technologies in physical education in general secondary education institutions in Ukraine, aimed at increasing students' motivation for physical education, their level of physical activity, and the formation of skills to acquire and apply knowledge in new educational and life situations.

The paragraph identifies options for introducing modern technologies in physical education classes and out of school hours, namely: health-saving technologies; interactive and project-based learning technologies; active involvement of students in new sports; organization and conduct of modern physical education and recreation activities; use of information and communication technologies; and introduction of fitness technologies.

Keywords: modern technologies, physical education, information and communication technologies, health-saving technologies, fitness technology.

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